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# E-PLASTICS IN EUROPE: AN OVERVIEW

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Plastics are used in most of sectors of the economy and manufacturing and production of electric and electronic equipment (EEE) is not an exception. Many parts of a conventional EEE (TVs, radios, smart phones, computers, etc.) are made of plastics. Use of plastics in EEE may depend on the type of equipment, but also on other factors, e.g., the year of manufacturing. Once the obsolete EEE is discarded it becomes waste EEE, or WEEE. The share of plastics in EEE has been increasing and hence the amounts of waste plastics discarded as part of WEEE are expected to increase. A share of WEEE is recovered for recycling through dedicated collection schemes, primarily regulated by the WEEE Directive in the European Union (EU, 2012/19/EU). Some of the plastic content of WEEE could also be recycled, however, there is a lack of comprehensive understanding of magnitudes, composition, fate and potentials of plastics recovery from WEEE.

The goal of this work is to provide an overview of plastics flows in EEE in Europe, reflecting on waste management and the current situation, potentials for improvement and challenges. This work has been primarily done through collection of industry statistics and literature data, but also through contacts with industry representatives. In terms of waste management, both pre-consumer and post-consumer waste plastics were considered. A simplified schematic representation of the plastic flows within EEE in the EU is provided in Figure 1.

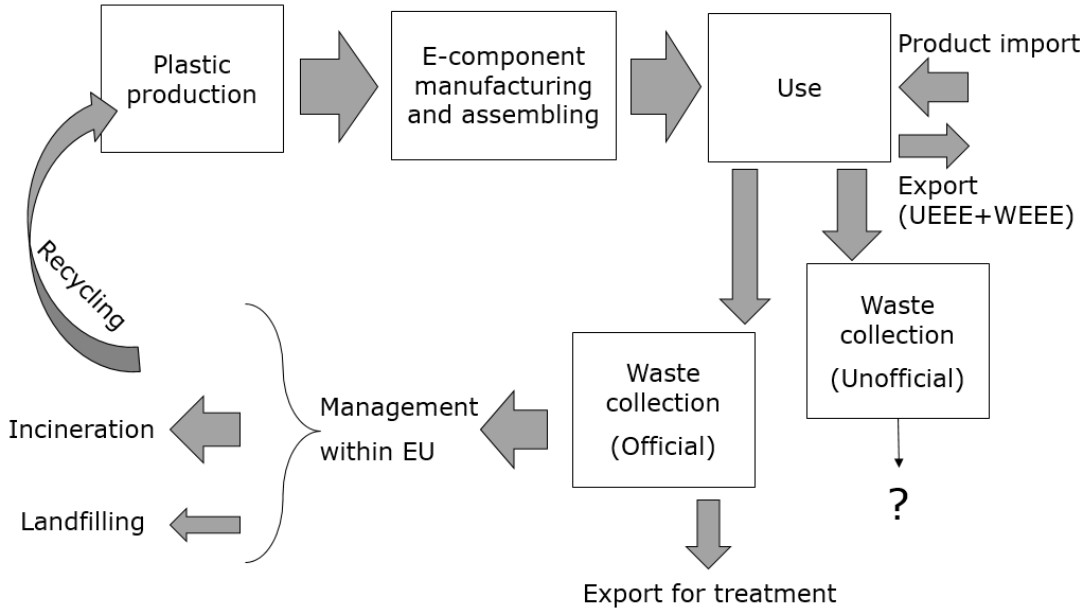


Figure 1. Schematic representation of plastic flows in electric and electronic equipment (EEE) in the EU (UEEE and WEEE stand for used and waste EEE, respectively).


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In 2014 almost 10 million tonnes of WEEE were generated in the EU. Less than 40% (w/w) of the generated WEEE were collected in compliance with the EU legislation and the majority was either collected and treated in non-compliant way within the EU or exported as used EEE (UEEE) or waste. A significant share of WEEE is involved in undocumented trade, where fate of plastics is as well unknown.

There is a significant amount of plastics used in EEE, with more than 3 million tonnes being used in 2016 for EEE production in the EU. In terms of polymer composition, the most common plastics used are acrylonitrile butadiene styrene (ABS), polycarbonate (PC), polypropylene (PP) and other thermoplastics, together accounting for more than 50% (w/w) of the plastics used in the sector. Of the plastics recovered from WEEE the majority is being incinerated, followed by recycling and landfilling; almost as much plastics from WEEE are being recycled as being landfilled.

In 2016, approximately 500,000 tonnes of plastics were recovered for recycling from manufacturing of EEE and treatment of WEEE in the EU. In the same year, more than 1,000,000 tonnes were either incinerated or landfilled. In addition, more than 1,000,000 tonnes of plastics in WEEE were either collected and treated in non-compliant way or were scavenged for parts and fractions. Undocumented and documented export of UEEE and WEEE accounted for additional 500,000 tonnes of plastics being exported from the EU. Finally, approximately 1,500,000 tonnes were estimated to be accumulated in stock in 2016. From the recovered plastics from EEE and due to potentially considerable losses in plastics re-processing (primarily due to material shredding), less than 300,000 tonnes were estimated to be re-processed to be used as recycled plastics in products. This value represents approximately 5% (w/w) of the total amount of plastics used in EEE in the EU. However, considering significant share of UEEE and WEEE exports, potential undocumented re-processing in the EU and potential imports of recycled plastics (either as raw materials or as part of imported products), it is safe to assume that additional amounts of recycled plastics from WEEE may be present on the European market.

Among the different polymers used in the EEE, ABS, PP, polystyrene (PS), and polyvinyl chloride (PVC) are currently recovered in considerable amounts. In some cases plastics from WEEE are being recycled directly into products, without previously being converted into pellets. Such re-processing occurs primarily with mixed plastics, from which products with low quality requirements (e.g., plastic lumber) are manufactured. There are several factors which limit recycling of plastics from WEEE, namely:

- Inefficient collection of WEEE for re-processing
- Potentially low efficiency of waste plastics separation
- Use of a large variety of (specialty) plastics in EEE
- Potential use of hazardous additives or substances of concern
- Use of plastic blends (e.g., PC/ABS)

Considering the current situation with plastics waste management from EEE in the EU, there is a great potential to improve management of WEEE and increase plastics recycling rates and the overall material recovery. While the factors limiting WEEE plastics recycling should be considered in designing phase of the electric or electronic products (as specified in the WEEE directive (2012/19/EU)), considerable lifespan of some product categories within EEE means the issue of plastics recovery from WEEE may be challenging to solve in a short term.